aa501

graphicx natbib ();a,

$M_\odot$ $M_{wd}$ $T_{eff}$ $P_{rot}$ $H\alpha$ $H\beta$ $H\gamma$

document

Magnetic white dwarfs in the Early Data Release of the Sloan Digital Sky Survey

B.T. Gänsicke1 F. Euchner2 S. Jordan3 B. Gänsicke, e-mail: btg@astro.soton.ac.uk

Department of Physics and Astronomy, University of Southampton, Southampton SO17 1BJ, UK Universitäts-Sternwarte, Geismarlandstr. 11, 37083 Göttingen, Germany Institut für Astronomie und Astrophysik, Universität Tübingen, Sand 1, 72076 Tübingen, Germany

Received _____; *accepted*_____

We have identified 7 new magnetic DA white dwarfs in the Early Data Release of the Sloan Digital Sky Survey. Our selection strategy has also recovered all the previously known magnetic white dwarfs contained in the SDSS EDR, KUV 03292+0035*andHE*0330−−0002.*AnalysingtheSDSSfibrespectroscopyofthemagneticDAwhitedwarf*
*of−the−artmodelspectra,wefinddipolefieldstrengths*1.5 $MG \leq B_d \leq 63\,MG$*andeffectivetemperatures*8500≤≤
39 000 $K$.*Asaconservativeestimate,weexpectthatthecompleteSDSSwillincreasethenumberofknownmagneticwhitedwarfs*

Introduction The population of magnetic white dwarfs spans an enormous parameter space in magnetic field strength $B$, effective temperature , rotational period , atmospheric abundances, and mass – with the number of accurate measurements per parameter dimension decreasing in this sequence. Despite intense spectroscopic and polarimetric surveys carried out over the last two decades [e.g.][]schmidt+smith95-1, putney95-1, putney97-1, hagenetal87-1, reimersetal94-1, reimersetal96-1, reimersetal98-1, only $\sim$ 65 magnetic white dwarfs are known at present jordan01-1,wickramasinghe+ferrario00-1. The small size of this sample seriously hampers the progress of our understanding of the origin of the strong magnetic fields found in a small fraction (few %) of all white dwarfs, as well as of the evolution of these exotic stars.

The Sloan Digital Sky Survey (SDSS), the largest spectroscopic survey carried out to date, samples a great variety of galactic and extragalactic objects at high galactic latitudes. Due to the partial overlap in colour space between white dwarfs and quasars, it can be expected that the SDSS will result in the identification of a large number of white dwarfs and, hence, in a significantly increased sample of known magnetic white dwarfs. Here we describe the sample of magnetic white dwarfs identified in the Early Data Release of the SDSS.

table*[t] []t-sdssobs Confirmed and candidate magnetic white dwarfs from the SDSS EDR. The equinox/epoch 2000 coordinates are coded in the object designation. The objects are classified in the SDSS EDR as stellar (S) or unknown (U). The spectra are uniquely identified in the SDSS database by the combination of the Plate ID, the modified Julian date, and the fibre ID of the observation. The magnitudes listed here are from the associated imaging data. flushleft 1.2ex tabularlllllccccc

MWD 2cClass. Sample Spectrum ID Obs. date Exp. $u^*$ $g^*$ $r^*$ $i^*$ $z^*$

Sloan Digital Sky Survey observations The Sloan Digital Sky Survey is an ambitious project which will provide deep CCD imaging of $\sim$ 10 000 deg$^2$ of the north Galactic cap in five optical bands, as well as low-resolution spectroscopy for $\sim 10^6$ astronomical objects selected on the base of their colours derived from the imaging data. Both, imaging and spectroscopy are carried out with the purpose-built SDSS 2.5 *mtelescopelocatedatApachePointObservatory.TheSDSSfollow−upspectroscopyisobtainedusingtwofibre−*
*fedspectrographsthatallowtoobservemorethan*600*objectssimultaneously.Thespectrographscover*3800−−9200 *Åataspectra*
1800. The reduction of the spectral data is performed by an automated software pipeline. For a technical description of the survey, see yorketal00-1. Even though the main purpose of this project is to produce the most comprehensive galaxy and quasar redshift survey to date (the majority of the spectrograph fibres are allocated to galaxy/quasar candidates) it delivers a vast amount of data for detailed studies of the galactic stellar population. A few recent examples of such studies are the discoveries of a very cool white dwarf harrisetal01-2, of a sample of cataclysmic variables szkodyetal02-2, and of a sample of carbon stars margonetal02-1.

The Early Data Release (EDR) of the SDSS stoughtonetal02-1 contains imaging data for 462 deg$^2$ and a total of 54008 fibre spectra obtained in that region.

figure [width=8.8cm]ms2962f01.ps []f-colours SDSS colour-colour diagrams of the stellar component of the EDR. The magnetic white dwarf candidates selected from the "stellar" and "non-stellar" fraction of the EDR sample are plotted as filled circles and filled triangles, respectively (top and middle panel). Hot

stars – mainly white dwarfs and subdwarfs – are clearly separated from the bulk of the main sequence stars in the lower left quadrant of the $u^* - g^*/g^* - r^*$ diagram. The bottom panel shows DA (solid lines) and DB (dashed lines) cooling tracks of non-magnetic white dwarfs for surface gravities $\log g = 7.0$ to 9.0, computed from model spectra (P. Bergeron, private communication). The DA cooling tracks range from $= 100\,000\,K(left)to1500\,K(right)andcrosseachotherinthegapbetweenthehotstarsandthemainsequenceat\simeq 7000\,K.TheDBcoolingtracksrangefrom$=$30\,000\,K(left)to4000\,K(right).Themagneticwhitedwarfcandidatesdiscussedinth$